

Appl. No. 09/633,760
Amendment and/or Response
Reply to Office action of 5 May 2004

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REMARKS / DISCUSSION OF ISSUES

Claims 1-12 and 17-25 are pending in the application. Claims 17-25 are newly added.
No new matter is introduced.

The Office action rejects:

claims 1-4, 6, and 11-12 under 35 U.S.C. 102(b) over Weinshall et al. (*From Ordinal to Euclidean Reconstruction with Partial Scene Calibration*, hereinafter Weinshall),
and

claim 5 under 35 U.S.C. 103(a) over Weinshall and Wilson et al. (USP 5,386,299, hereinafter Wilson).

The applicants respectfully traverse these rejections.

Claims 1 and 11, upon which claims 2-6 and 12 depend, specifically claim a method of determining a position of an unknown point in space that includes generating in each of two cameras an image corresponding to at least four points lying in a reference plane, the reference plane being common to the respective images of the cameras, and calculating a planar projective transform that maps the images of the at least four points to a reference frame, the reference frame being a projection of the reference plane.

The Examiner's attention is requested to MPEP 2131, wherein it is stated:

"A claim is anticipated only if *each and every element* as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). "The *identical invention* must be shown in as *complete detail* as is contained in the ... claim." *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).

Weinshall is silent with regard to the use of four points from images of each camera lying in a common plane. Weinshall's reference points are specifically designed to be a variety of arbitrarily selected points in an image, and, as discussed further below, necessarily include points that are not in a common reference plane. The Office action fails to address the claimed limitation of camera images that each contain four points lying in a common reference plane, and thus the applicants respectfully maintain that the rejection of these claims under 35 U.S.C. 102(b) and 103(a) are unfounded.

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Because Weinshall does not teach or suggest the use of four points from images of each camera lying in a common plane, as specifically claimed in each of the independent claims 1 and 11, the applicants respectfully request the Examiner's reconsideration of the rejection of the above claims over Weinshall.

The Office action rejects:

claims 7, 8, and 10 under 35 U.S.C. 103(a) over Weinshall and Wilson; and claim 9 under 35 U.S.C. 103(a) over Weinshall, Wilson, and Proesmans et al. (USP 6,510,244).

The applicants respectfully traverse these rejections.

Claim 7, upon which each of the rejected claims depend, specifically claims a system that includes a jig that supports at least two cameras, at least two calibration markers in a position to be substantially visible by each of the at least two cameras, and at least four reference markers in a visual field of each of the at least two cameras, all of the reference markers lying in a common plane.

The Office action asserts that Weinshall teaches a system having a jig that supports two cameras, two calibration markers, and four reference markers in the field of view of each of the cameras. The applicants respectfully disagree with this assertion.

Weinshall teaches a method of determining positions of objects without using a defined structure: "the images were obtained using a hand-held video camera in a casual manner, without making controlled measurements of the camera or scene parameters" (Weinshall, page 216, last full paragraph). Weinshall teaches collecting images of objects, finding parallel lines to perform affine reconstruction, then Euclidean reconstruction. In order to perform the affine reconstruction, a ratio of two depths must be known, and in order to determine absolute depth, one of these depths must be known. (Weinshall, page 216, paragraphs 2-6.) Weinshall does not teach creating a jig to facilitate determining the ratio or the depth of a point; instead, Weinshall specifically teaches: "We arbitrarily select two out-of-plane points as "reference points"" (Weinshall, page 216, lines 1-2).

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Similarly, as noted above, Weinshall does not teach using four reference marks in each of the visual fields of the cameras that lie in a common plane. Weinshall teaches using the homography that relates each image to a reference plane, and maps a set of reference points in the images to the reference plane. These reference points must be visible in each image, but Weinshall does not further constrain the choice of these reference points, and specifically does not teach that each of these reference points must lie in a common plane. As noted above, Weinshall uses two of these reference points for determining a ratio of depths relative to the reference plane, and thus it can be further inferred that Weinshall does not assume that the reference points lie in a common plane.

Further, the applicants respectfully disagree with the proposed combination of Weinshall and Wilson, because these references are each in a different field of the art. Weinshall addresses determining the location of objects based on the appearance of the object in multiple views of the object. Wilson teaches an arrangement of cameras for two-sided document scanning. Wilson's cameras do not have a common field of view and cannot be used to determine a location of an object based on the images from each of the cameras, as taught in Weinshall, or as taught in the applicants' disclosure. A practitioner of the art of location-determination based on visual images would not be lead to an invention in the art of document scanning, as suggested by the Examiner. Further, the applicants cannot discern any of the limitations of the applicants' claims in Wilson.

Because neither Weinshall nor Wilson, individually or collectively, teach or suggest a system that includes a jig that supports at least four reference markers lying in a common plane in a visual field of each of at least two cameras, as specifically claimed by the applicants, the applicants respectfully requests the Examiner's reconsideration of the above rejections over Weinshall and Wilson.

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In view of the foregoing, the applicants respectfully request that the Examiner withdraw the rejections of record, allow all the pending claims, and find the application to be in condition for allowance. If any points remain in issue that may best be resolved through a personal or telephonic interview, the Examiner is respectfully requested to contact the undersigned at the telephone number listed below.

Respectfully submitted,



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